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wholly upon those secondary results of mental activity which are expressed in the form of physical changes. From these he must analogically reconstruct the set of psychical changes which it is the intention of his psychology to describe. His way is thus beset with peculiar difficulties, and every precaution must be taken to guard against false interpretation of the data. Reaction from the flagrant error of freely reading human motives and play of ideas into the actions of the lower animals must not lead us into the equally false position of assuming that the simplest explanation of such conduct must necessarily be the true one. When my dog follows me to the corner of the street and, on seeing me turn in the direction of the market square where he has been roughly used, instead of toward the college yard whither he has always followed me with delight, drops suddenly upon his haunches, watches my steps a moment, and then turns homeward, his action is to be explained in accordance with the more complex hypothesis, not with the simpler. His interest has not died out, nor has a new object attracted him. The desire to accompany me is still a living motive, but its effect is transformed into an act of the opposite nature through the more powerful motive of fear. This is but an illustration of a condition of affairs which is constantly met with, in which the advocates of the simplest explanation are wholly out of court. Inhibition plays a tremendous part as a determinant of action in the lower animals, and the deficiency of our accounts of their mental life is doubtless in part due, as Professor Mills says, to the fact that "insufficient attention has been given to distinguishing between normal, sub-normal, and super-normal comparative psychology," and especially, I may add, to the lack of an intimate study of the relation of the animal to its environment with regard to the facts of inhibition and disturbance of normal motivation.

ROBERT MACDOUGALL.

ZOÖLOGY.

Some Japanese Oligochæta. — In the course of the year 1898, three papers on "Japanese Oligochæta" appeared in the *Annotationes Zoölogicæ Japonenses*, which materially extend our knowledge of this division of Japanese fauna. In the first of these — "On a New Species of Littoral Oligochæta" (*Pontodrilus matsushimensis*)[1] — Akira Iizuka describes a new species of Pontodrilus.

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[1] *Annotationes Zoölogicæ Japonenses*, vol. ii, Pt. i, pp. 21–26.

This species lives in sand along the shore of Matsushima Bay, and so has the same sort of habitat as have several other species of the same genus, which are found along the seashores of other countries.

P. matsushimensis agrees with the other Pontodrilus species known to Iizuka in most characters of generic value, as the genus is defined by Beddard in his monograph; the chief difference being in the position at which the sperm duct actually opens into the spermiducal gland. According to Beddard, the position of this opening is at the "junction of glandular and muscular parts" of the spermiducal gland, while in the Japanese species the sperm duct enters the wall of the glandular part near its junction with the muscular portion, and then traverses the wall to the other end of the glandular portion before actually communicating with its lumen. As this relation of the sperm duct to the spermiducal gland is apparent only from a study of serial sections, and as Iizuka assumed that no other species of Pontodrilus had been studied in this way, he concluded it probable that similar relations would be found to exist in the other species. The writer seems not to have been aware of the extended and careful work of Eisen[1] on *Pontodrilus michælseni*, published in 1895. Eisen's account of this species is accompanied by numerous figures made from cross-sections, and shows that the superficial entrance of the sperm duct into the spermiducal gland has nearly the same position as in the case of *P. matsushimensis*, but furnishes no evidence that the internal communication is the same. On the contrary, it would indicate that the communication of the lumen of the sperm duct with that of the gland is near the point of the superficial entrance of the duct into the gland. This condition of things in *P. michælseni*, while it may render doubtful the correctness of Iizuka's assumption that other species of Pontodrilus will be found to have the same relation of sperm duct and spermiducal gland as exists in *P. matsushimensis*, helps to bridge over the differences between that species and the others, and so lessens the necessity for establishing a new genus to receive it.

"New or Imperfectly Known Species of Earthworms" is the title of a paper in which the authors give us the first of a series of articles which they propose to contribute on the Oligochæta of Japan.[2]

In a third paper are described sixteen new species of Perichæta, and mention is made of one other species which they doubtfully identify with *P. sieboldi* Horst, the first Perichæta species described from Japan, and one well known in European museums. Of over two hundred specimens belonging to this species, all without exception differed from the descriptions of *P. sieboldi* by European writers in one important character, *viz.*, the position of the spermathecæ. Since many of their specimens were collected from the same region from which the European specimens were known, or supposed to have been collected, it seems to be the inference of the authors that their species is identical with *P. sieboldi*, and that the European writers erred in their description of that species. Unfortunately their own description is so extremely meager that it is of little use to any one else who might attempt to determine the relations of their species to others already described.

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[1] Pacific Coast Oligochæta, I, *Mem. Cal. Acad. Sci.*, vol. ii, No. 4.

[2] Goto, S., and Hatai, S. New or Imperfectly Known Species of Earthworms, No. 1, *Annotationes Zoöl. Japonenses*, vol. ii, Pt. iii, pp. 65–78.

Horst,[1] who first described *P. sieboldi*, has reëxamined the type of that species and confirmed the correctness of the earlier descriptions, and concludes that the two species are not identical.

The genus Perichæta already includes a hundred or more species, and the need is great for more detailed descriptions than those which our authors have seen fit to give us.

Horst calls attention to the peculiar fact that of the nine species of Perichæta previously described from Japan, none have come under the observation of Goto and Hatai.

In a third paper[2] is described a species living in the gutters and ditches of Tokyo, and belonging to the family Tubificidæ. These worms seemed to the author to be more nearly allied to *Vermiculus pilosus*, described from the southern coasts of England by Goodrich in 1892, than to any other form, and so are included in the same genus under the name *V. limosus.*

The description is reasonably complete and includes eight pages of text, accompanied by five diagrammatic figures.

Among the more noticeable peculiarities of the new species are the short, nearly straight sperm ducts which open into a common ventral spermiducal chamber on the eleventh somite, and the unpaired opening of the spermathecæ on the ventral side of somite X, both of which characters it has in common with the other member of the genus. Some peculiarities in which it differs from *V. pilosus* are the single sperm sac, which is evaginated from the anterior septum of somite X into the ninth somite, from which it extends backward to the twelfth or thirteenth somite; and the ovisac, which extends backward from the twelfth somite instead of from the eleventh, as is more usually the case.

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[1] Horst. On *Perichæta sieboldi*, *Notes from the Leyden Museum*, vol. xx, pp. 240–242.

[2] Hatai, S. On *Vermiculus limosus*, a New Species of Aquatic Oligochæta, *Annotationes Zoöl. Japonenses*, vol. ii, Pt. iv, pp. 103–111.

Hatai has experienced the difficulties so common in the preparation of purely technical papers of eliminating errors from the text, and we find the ovaries described as being located in somite X, while they are figured in somite XI. The latter position is undoubtedly the correct one; again, the sperm ducts are described as having the funnels in the ninth somite, while the main parts of the ducts are in the tenth somite, on the ventral side of which they open to the exterior. In the figure, which is more probably correct, they are represented as being situated one somite farther back. It is stated that there is a pair of ovisacs in the thirteenth somite, "formed by the backward bulging out, on the left dorsal side, of the anterior septum." As elsewhere in the text, reference is made in each case to "the ovisac," and as it seems improbable that both members of the pair should arise on the same side of the worm, it seems more reasonable to suppose that there is but one ovisac. F. SMITH.

Strange Protoplasmic Budding in Epithelial Cells.— Every specialist is familiar with the occurrence of various vesicles and drop-like extrusions that may be found upon preserved epithelium, as if excreted. The formation of such "artefacts" has not been studied. Recently Martin Heidenhain, in the *Archiv. f. Mik. Anatomie*, Vol. LIV, pp. 59–67, has, however, described and figured peculiar finger-like protrusions from the cells of the epithelium of the uterus of a pregnant rabbit, and interpreted them as the first stages in the making of such "artefacts."

The material was hardened in corrosive sublimate, and the author conceives that this penetrating in molecular dilution acted as a stimulus to call forth a physiological, though pathological, response in the form of those protoplasmic protrusions, or pseudopodia.

How these protuberances later form the real artefacts, the vesicles, etc., that lie free from the cells, is not considered, since the chief thesis is that peculiar dark-staining bodies in each protuberance are centrosomes. The author advances much in favor of this view, and we seem to have here another case where motion of the protoplasm, in rising up to make protrusions of the surface matter, is localized about staining centers, or "centrosomes." E. A. A.